Appendix A

End-of-Well Reports, Boring Logs/Geophysical Logs, Core Photos (on CD)

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End-of-Well Reports, Boring Logs/Geophysical Logs, Core Photos (on CD)

A-1. FIELD ACTIVITIES

This End-of-Well Report summarizes information on drilling and sampling activities associated with borings ICPP-1795 through ICPP-1798.

A-1.1 Overview

A-1.1.1 Documents

The Operable Unit (OU) 3-13, Group 5, HI interbed drilling was conducted under the following documents:

- *Monitoring System and Installation Plan for Operable Unit 3-13, Group 5, Snake River Plain Aquifer*, DOE/ID-10782
- *Plume Evaluation Field Sampling Plan for Operable Unit 3-13, Group 5, Snake River Plain Aquifer*, DOE/ID-10784
- *Health and Safety Plan for Operable Unit 3-13, Group 5, Snake River Plain Aquifer*, INEEL/EXT-2000-00817
- *Waste Management Plan for Operable Unit 3-13, Group 5, Snake River Plain Aquifer Project*, DOE/ID-10829
- Well drilling Statement of Work for Group 5.

A-1.1.2 Logbooks

Activities conducted during the OU 3-13, Group 5, HI interbed drilling were recorded and documented in the following logbooks. These logbooks were maintained in accordance with applicable company policies and procedures.

- Field Team Leaders Logbook ER-051-2002 for activities conducted before October 21, 2002. The field logbook, recorded by Arden Bailey, was submitted for archive and optical imaging to the Sample and Analysis Management logbook coordinator.
- Field Team Leaders Logbook ER-133-2002 for activities after October 21, 2002. The field logbook, recorded by Arden Bailey, was submitted for archive and optical imaging to the Sample and Analysis Management logbook coordinator.
- Record of Rotary Drillhole ER-054-2002 for air rotary drilling activities associated with this project. The field logbook, recorded by project field geologist Stewart Smith, was submitted for archive and optical imaging to the Sample and Analysis Management logbook coordinator.

- Record of Corehole ER-065-2002 for wireline coring activities associated with this project. The field logbook recorded by project field geologist Stewart Smith was submitted for archive and optical imaging to the Sample and Analysis Management logbook coordinator.

- Sample Logbook ER-066-2002 for sampling activities associated with this project. The field logbook recorded by Arden Bailey was submitted for archive and optical imaging to the Sample and Analysis Management logbook coordinator.

- Site Attendance Logbooks ER-105-2002 and ER-067-2002 contain project personnel attendance records at sites associated with this project. Project personnel recorded logbook entries and submitted the logbooks to the Sample and Analysis Management logbook coordinator for archive and optical imaging.

A-1.1.3 Drilling Company

The Idaho National Engineering and Environmental Laboratory (INEEL) awarded the OU 3-13, Group 5, HI interbed coreholes drilling contract to Dynatec Drilling, USA of Salt Lake City, Utah. The INEEL issued the letter to proceed with drilling on July 24, 2002. The drilling team completed the field portion of the project on November 18, 2002. The completion of field activities took 116 days. The drilling subcontractor typically worked a 5 day-per-week schedule of 12 hours per day.

A-1.1.4 Field Team

The air rotary drill rig operators for Dynatec Drilling were Arden Hawley and Justin Hanson. Louis Rosario operated the core rig.

The field team leader was Arden Bailey (PS2 & Associates). The project geologists were Stewart Smith (MSE Inc.) and Arden Bailey (PS2 & Associates).

A-1.2 Drilling and Sampling Methods

Procedures for drilling the HI interbed sampling wells were specified in the Field Sampling Plan and in the subcontractor Statement of Work. Several changes to the planned drilling methods were initiated in the field and incorporated into the drilling subcontract through changes issued by the construction coordinator. The following sections detail the overall planned drilling methods along with the changes that specific problems required.

A-1.2.1 Planned Placement of Surface Casing

The Statement of Work specified the use of the foremost Dual Rotary 24 drill rig to set the surface casing through the alluvium and into the top of the basalt. The dual rotary rig was to advance the 24-in.-diameter casing to the top of basalt and bore into the basalt 2 ft with a 20-in.-diameter downhole hammer and bit. The hammer and bit were to be tripped out of the hole and the 16-in.-diameter surface casing installed through the alluvium and 2 ft into the basalt. Cement grout was to be placed into the annular space surrounding the 16-in.-diameter surface casing as the 20-in. dual rotary casing was removed.

A-1.2.2 Actual Installation of Surface Casing

The INEEL CERCLA Disposal Facility (ICDF) monitoring borehole installation project was using the dual rotary drill rig during the time that this rig originally was scheduled to be available for Group 5 surface casing installation. The higher priority assigned to the ICDF project made it difficult to use the rig for the Group 5 project. This difficulty in setting the surface casing delayed the timely completion of the Group 5 project. When the dual rotary rig was not available, a single-flight solid-stem auger was used on the Schram air rotary rig to set surface casing.

A-1.2.3 Planned Drilling within the Vadose Zone

The Statement of Work specified the use of an air rotary rig to drill a 6-3/4-in.-diameter borehole through the vadose zone. Drilling of the northern-most borehole (ICPP-1795) was to be accomplished with the use of only compressed air as a drilling fluid. Water could be used in the remaining boreholes if perched groundwater was not encountered in the northern hole. It was planned to use the drill cuttings to contour and grade the well pad area if gamma scans indicated that the cuttings contained no cesium-137 above 23 pCi/g.

A-1.2.4 Actual Drilling within the Vadose Zone

A Schram Model 685 W air rotary rig was used to drill a 6-3/4-in.-diameter borehole through the vadose zone. The northern borehole (ICPP-1795) was drilled with air to determine if perched water was present. After water was not encountered in the northern hole, a water and air mixture was used to drill the remaining holes. Gamma scans were conducted on the vadose zone cuttings to determine if elevated radionuclides were present. The borehole pad area was graded and contoured with these cuttings after the gamma scans showed no detectable levels of cesium-137 contamination.

A-1.2.5 Planned Drilling within the Saturated Zone

The preferred drilling option within the saturated zone was to advance the borehole below the water table using a wireline core system; however, coring was only necessary through the HI interbed to collect sample material. All cuttings were managed and disposed of in accordance with the *Waste Management Plan for Operable Unit 3-13, Group 5, Snake River Plain Aquifer*.

Coring was planned to begin with a “P” or CHD 134 core system and later downsized to an “H” size as needed in or below the HI interbed. The “P” or CHD 134 size drill rods could be used as temporary casing of the borehole, if required.

A-1.2.6 Actual Drilling within the Saturated Zone

The northern- and southern-most boreholes (ICPP-1795 and ICPP-1798) were cored from approximately 10 ft above the regional aquifer to the total depth of the borehole. To speed the project schedule, the middle two boreholes were drilled with the air rotary rig, using a down hole hammer and 6-3/4-in.-diameter bit to a depth estimated to be 20 ft or more above the HI interbed. Coring was started in all boreholes with a CHD 134 core system and later downsized to an “H” size when interbed or rubble conditions required temporary casing. The temporary casing of the hole with the CHD 134 rod made coring possible through the flowing sands and silts of the HI interbed.

A-1.2.7 Planned Sampling Activities

A-1.2.7.1 Interbed Material. The Field Sampling Plan and the Sampling and Analysis Plan tables specified that HI interbed material was to be collected for geotechnical and radionuclide analysis. The geotechnical samples were to be collected in situ by using lexan liners within the core barrel. Samples were planned to be collected from the upper, middle, and lower portions of the interbed.

A-1.2.7.2 Groundwater Sampling. Groundwater samples for Sr-90, I-129 (normal detection limits—1 pCi/L), gross alpha, gross beta, and tritium were to be collected from up to 10 separate zones in each of the borings using a straddle packer and pump system. Additional sampling was conducted above, within, and below the HI interbed for Tc-99 and I-129 (low-level detection).

A-1.2.8 Actual Sampling Activities

A-1.2.8.1 Interbed Material. Difficulty was encountered in collecting in situ interbed samples due to heaving sand and silt conditions. Some samples were collected in the lexan liners in an intact condition; however, much of the interbed material collected was disturbed during sample collection. This disturbed material required additional processing by the geotechnical laboratory. Only two sets of samples were collected from the interbed at the northern location due to the limited thickness. Additional sets of samples were collected at the southern location due to the greater thickness of the interbed at this location and the lithologic changes that were observed within the interbed.

A-1.2.8.2 Groundwater Sampling. A Grunfos Redi-flow 3 (3-in. diameter) pump with a Baski straddle packer system was used for the straddle packer sampling. The standard open pump intake was replaced with a prepacked silica sand screen for sampling water within the interbeds due to problems with the pump ingesting sand. If the groundwater contained too much silt and sand for the submersible pump, then a 4-in.-diameter high-density polyethylene bailer was used to collect the samples from within the interbed.

Water samples were collected from the zone above, within, and below the HI interbed, as specified in the Field Sampling Plan and Sampling and Analysis Plan tables. Typically, an additional two to three additional zones were sampled above the HI interbed.

A-1.3 Borehole 1795—North Boring

A-1.3.1 Borehole Location

Borehole coordinates are available at the INEEL Hydrologic Data Repository.

A-1.3.2 Drilling Activity

A-1.3.2.1 Surface Casing. Borehole ICPP-1795 drilling began on July 18, 2002. The surface casing was installed with a foremost dual rotary 24 rig. The dual rotary 24 advanced 24 in. outside diameter, 3/8-in. wall reverse threaded casing with a 13-in.-diameter bit and 12-in.-diameter downhole pneumatic hammer. The alluvium and basalt interface was encountered at approximately 12 ft below land surface. After removing the downhole hammer, a 16-in. outside diameter, 1/4-in. wall steel casing was placed into the 24-in. outside diameter, dual rotary casing. Cement grout was then placed around the outside of the 16-in. casing as the 24-in. casing was removed.

A-1.3.2.2 Vadose Zone. Borehole ICPP-1795 was advanced below the alluvium by a Schram model 685W air rotary drill rig on July 23, 2002. The Schram used a 6-in.-diameter downhole pneumatic hammer and a 6-3/4-in.-diameter bit. Drilling was accomplished using only air as a drilling fluid. This allowed detection of any indications of perched groundwater. After drilling to a depth of 460 ft below land surface the bit was tripped out and then tripped back in using water to clean the borehole wall. No indication of perched water was found within the vadose zone. Drilling and hole washing to 460 ft was completed on July 29, 2002. All drill cuttings from the vadose zone were placed in a 5,000-gal-capacity fractionation tank. During drilling, samples were collected and composited for gamma analysis. A gamma spectrometer analysis was performed on the sample (Sample Number JAD-054-02) at the INEEL Radioactive Materials Laboratory on July 30, 2002. No anthropogenic gamma-emitting radionuclides were detected. These drill cuttings met INEEL release criteria and were used to level and grade the borehole pad area.

A-1.3.2.3 Saturated Zone. Coring began at Borehole ICPP-1795 on August 15, 2002. A universal drill rig model 1000 (UDR 1000) advanced a CHD 134 size core bit (approximately 5-1/2-in. outside diameter). On August 23, 2002, the CHD 134 bit became stuck at a depth of 502 ft below land surface. Attempts to free the bit with the UDR 1000 were unsuccessful. The core rig was replaced with the Schram air rotary rig, as the pullback force capabilities of the UDR 1000 are somewhat limited. The Schram, with considerably more torque and pullback, was unable to free the bit. The UDR 1000 rig was placed back over the hole and on August 27, 2003, an "H" size core bit (approximately 3-7/8-in. outside diameter) advanced through the CHD 134 bit and into underlying basalts. Drilling was completed using the "H" size core bit to 647.8 ft below land surface. The HI interbed was encountered from 587.3 to 594.0 ft below land surface.

A-1.3.3 Sampling

Borehole ICPP-1795 sampling began on October 8, 2002, and ended on October 9, 2003. A straddle packer assembly was used to sample discrete zones within the Snake River Plain Aquifer (SRPA). Sample zones and associated sample series numbers are shown in Table A-1.

Table A-1. Straddle packer sampling for Borehole ICPP-1795.

Sample Series Number	Sample Description	Depth to Top of Upper Packer (ft)	Depth to Bottom of Upper Packer (ft)	Depth to Top of Lower Packer (ft)	Depth to Bottom of Lower Packer (ft)
5HI049	Zone 1	575.4	578.7	593.6	596.9
5HI050	Zone 2	554.8	558.1	573.0	576.3
5HI051—Dry	Dry	491.4	494.7	509.6	512.9
5HI051—Dry	Dry	508.5	511.8	526.7	530.0
5HI051—Dry	Dry	530.6	533.9	548.8	552.1
5HI058	Zone 10	605.1	608.4	623.3	626.6
5HI059	Above	554.8	558.1	573.0	576.3
5HI060	Below	605.1	608.4	623.3	626.6
5HI061	Within	575.4	578.7	593.6	596.9

A-1.3.4 Borehole Completion

Abandonment activities for Borehole ICPP-1795 began on August 20, 2003. Dynatec drilling used a Longyear LF-70 drill rig advancing a 3-in.-diameter tri-cone bit on "N" sized drill rod to clean the borehole of collapsed material. "Quick-grout" slurry (900 gal) was pumped into the borehole through the drill string after the borehole was cleaned to TD. The drill bit was then removed and 75 gal of coated bentonite pellets were tremmied into the borehole. Two hundred eight bags of bentonite casing seal were then placed into the borehole. Seven bags of cement were mixed into a cement grout slurry to fill the upper portion of the borehole. A concrete pad with a brass survey marker was installed to mark the abandoned borehole's location. Depths of completion materials were not measured.

The following materials were used:

- "Quick Grout"—16 bags
- Coated bentonite pellets—75 gal
- Casing seal—208 bag, 50 lb each
- Cement—7 bags.

A-1.3.5 Geological Observations

Lithologic logs and geophysical logs for Borehole ICPP-1795 are included in Appendix A-A, and core photos are included on a CD attached to this report..

A-1.4 ICPP-1796—West Boring

A-1.4.1 Borehole Location

Borehole coordinates are available at the INEEL Hydrologic Data Repository.

A-1.4.2 Drilling Activity

A-1.4.2.1 Surface Casing. Drilling began on Borehole ICPP-1796 on August 1, 2002. The borehole was advanced to approximately 13 ft below land surface with the Schram 685W air rotary rig using a 28-in.-diameter solid stem, single flight auger on 24 ft of drill rod. Very loose gravel and caving borehole conditions were encountered at this depth. On August 16, 2002, a foremost Dual Rotary 24 successfully installed the surface casing. The Dual Rotary 24 advanced 16 in. outside diameter, 3/8-in. wall reverse threaded casing with a 13-in.-diameter bit and 12-in.-diameter downhole pneumatic hammer. The alluvium and basalt interface was encountered at approximately 20 ft below land surface. A 12-in. outside diameter, 1/4-in. wall casing was placed into the 16-in. outside diameter dual rotary casing after the downhole hammer was removed. Cement grout was used to fill the annular space outside of the 12-in. casing as the 16-in. dual rotary casing was removed.

A-1.4.2.2 Vadose Zone. Borehole ICPP-1796 was drilled below the alluvium on August 17, 2002. The Schram Model 685W air rotary drill rig used a 6-in.-diameter downhole pneumatic hammer and a 6-3/4-in.-diameter bit. Injected water and air were used as a drilling fluid. The bit was tripped out after drilling to a depth of 460 ft below land surface. Drilling to 460 ft below ground surface was completed on August 20, 2002. All drill cuttings from the vadose zone were placed in a 5,000-gal-capacity

fractionation tank. During drilling, samples were collected and composited for gamma analysis. A gamma spectrometer analysis performed on the sample (Sample Number KFM-039-02) at the INEEL Radioactive Materials Laboratory on September 3, 2002, detected no anthropogenic gamma-emitting radionuclides. The drill cuttings met normal INEEL release criteria and were used to level and grade the borehole pad area.

A-1.4.2.3 Saturated Zone. Drilling of Borehole ICPP-1796 into the saturated zone began on September 20, 2002. The UDR 1000 was used to advance the 6-3/4-in. downhole hammer bit from 460 to 471 ft below land surface. The main winch line parted at 471 ft below land surface during bit and hammer removal, and the drill string fell downhole. The drill string was removed on September 21, 2002. After the bit and drill string were removed, the CHD 134 drill rods were placed into the borehole and used as temporary casing in preparation for the coring.

Coring began with an "H" size (3.85-in. outside diameter) core bit on September 23, 2003. At 498 ft below land surface, an inner barrel mislatched, fell from the land surface, and knocked the core bit off the drill string. Attempts to recover the bit were unsuccessful. However, downhole video log showed that the bit had been pushed aside into a fracture zone. The bit was then cemented in place.

The 6-3/4-in. downhole hammer bit advanced the borehole to 590 ft below ground surface. Coring started again at 590 ft below ground surface and continued to 632 ft below ground surface. The HI interbed was encountered from 604.7 to 632 ft below land surface.

A-1.4.3 Sampling

A groundwater sample from the HI interbed was collected at 610 ft below ground surface using a high-density polyethylene 2-in.-diameter bailer. A temporary casing was used to seal off the zones above the HI interbed. Borehole ICPP-1796 straddle packer and pump sampling began on October 3, 2002, and finished on October 7, 2003. A straddle packer assembly was used to sample discrete zones within the SRPA. Sample zones and associated sample numbers are shown in Table A-2.

Table A-2. Straddle packer sampling for Borehole ICPP-1796.

Sample Series Number	Sample Description	Depth to Top of Upper Packer (ft)	Depth to Bottom of Upper Packer (ft)	Depth to Top of Lower Packer (ft)	Depth to Bottom of Lower Packer (ft)
5HI01	Zone 1	—	604.0	613.0	—
5HI02	Zone 2	0.0	0.0	487.0	490.0
5HI03	Zone 3	486.4	489.7	504.6	507.9
5HI04—Dry	Dry	512.7	516.0	530.9	534.2
5HI010	Zone 10	—	632.0	663.0	—
5HI011	Above	486.4	489.7	504.6	507.9
5HI012	Below	—	632.0	663.0	—
5HI013	Within	—	604.0	613.0	—

A-1.4.4 Borehole Completion

Abandonment activities for Borehole ICPP-1796 began on September 2, 2003. Dynatec drilling used a Longyear LF-70 drill rig advancing a 3-in.-diameter tri-cone bit on "N" sized drill rod to clean the borehole of collapsed material. "Quick-grout" slurry (850 gal) was pumped into the borehole through the drill string after the borehole was cleaned to TD. The 3-in.-diameter tri-cone drill bit and 20 ft of "N" sized drill rod "twisted off" and were left in the bottom of the borehole. Coated bentonite pellets (150 gal) was tremmied into the borehole. Two hundred twelve bags of bentonite casing seal were then placed into the borehole. Seven bags of cement were mixed into a cement grout slurry to fill the upper portion of the borehole. A concrete pad with a brass survey marker was installed to mark the abandoned borehole's location. Depths of completion materials were not measured.

The following materials were used:

- "Quick Grout"—16 bags
- Coated bentonite pellets—150 gal
- Casing seal—212 bags, 50 lb each
- Cement—7 bags.

A-1.4.5 Geological Observations

Lithologic logs and geophysical logs for Borehole ICPP-1796 are included in Appendix A-A, and core photos are included on a CD attached to this report.

A-1.5 Borehole ICPP-1797—East Boring

A-1.5.1 Borehole Location

Borehole coordinates are available at the INEEL Hydrologic Data Repository.

A-1.5.2 Drilling Activity

A-1.5.2.1 Surface Casing. A Dual Rotary 24 began installing the surface casing for Borehole ICPP-1797 on July 19, 2002. This rig used 24-in. outside diameter, 3/8-in. wall reverse threaded casing with a 13-in.-diameter bit and a 12-in.-diameter downhole pneumatic hammer. The alluvium and basalt interface was encountered at approximately 11 ft below land surface. After removing the downhole hammer, a 16-in. outside diameter, 1/4-in. wall casing was placed into the 24-in. outside diameter dual rotary casing. Cement grout was used to fill the annular space outside of the 16-in. casing as the 24-in. casing was removed.

A-1.5.2.2 Vadose Zone. Borehole ICPP-1797 was drilled below the alluvium on July 30, 2002. A Schram Model 685W air rotary drill rig used a 6-in.-diameter downhole pneumatic hammer and a 6-3/4-in.-diameter bit. Injected water and air were used as a drilling fluid. Drilling to 460 ft was completed on August 1, 2002, and the bit was tripped out. The drill cuttings from the vadose zone were placed in a 5,000-gal-capacity fractionation tank. During drilling, samples were collected and composited for gamma analysis. A gamma spectrometer analysis was performed on the sample (Sample Number JAD-58-02) at the INEEL Radioactive Materials Laboratory on August 5, 2002. No

anthropogenic gamma-emitting radionuclides were detected. The drill cuttings met INEEL release criteria and were used to level and grade the borehole pad area.

A-1.5.2.3 Saturated Zone. Borehole ICPP-1797 was drilled into the saturated zone on October 7, 2002, with a Schram Model 685W air rotary drill rig using a 6-in.-diameter downhole pneumatic hammer and a 6-3/4-in.-diameter bit. Water and air were used as drilling fluids. The bit was tripped out after drilling to 590 ft below land surface on October 9, 2002. All drill cuttings from the saturated zone were placed in a 5,000-gal-capacity fractionation tank. Samples collected during drilling were composited into a 5-gal container for later sample collection and analysis. Waste Generator Services collected samples from the waste material for characterization and transfer to the Idaho Nuclear Technology and Engineering Center (INTEC) CERCLA storage and staging area. The drill cuttings remaining in the fractionation tank were placed into three 55-gal-capacity waste drums with sufficient absorbent for any free liquids. The waste drums were then transferred to the INTEC storage and staging area.

Coring began on October 16, 2002, with the UDR 1000 drill rig using an "H" size (3.85-in. outside diameter) core bit. The HI interbed was encountered from 601 to 617.5 ft below land surface. Over-reaming of the borehole to 6-3/4 in. and installation of temporary casing to the bottom of the interbed were used to alleviate sloughing problems. The corehole was advanced using an "H" sized core bit beyond the second major fracture zone below the HI interbed to a total depth of 647.6 ft below ground surface.

A-1.5.3 Sampling

With casing still present through the interbed, samples were collected from below the HI interbed on October 18, 2002. The temporary casing was withdrawn to the piezometric surface and sampling of other zones was conducted on November 13, 2002, and November 14, 2002. A straddle packer assembly was used to sample discrete zones within the SRPA. Sample zones and associated sample numbers are shown in Table A-3.

Table A-3. Straddle packer sampling for Borehole ICPP-1797.

Sample Series Number	Sample Description	Depth to Top of Upper Packer (ft)	Depth to Bottom of Upper Packer (ft)	Depth to Top of Lower Packer (ft)	Depth to Bottom of Lower Packer (ft)
5HI017	Zone 1	586.0	589.3	604.2	607.5
5HI018	Zone 2	503.0	—	—	—
5HI019	Zone 3	503.0	506.3	521.2	524.5
5HI020	Zone 4	519.1	522.4	537.3	540.6
5HI021	Zone 5	548.3	551.6	566.5	569.8
5HI022	Zone 6	574.9	578.2	593.1	596.4
5HI026	Zone 10	626.0	629.0	—	647.6
5HI027	Above	503.0	—	—	—
5HI028	Below	626.0	629.0	—	647.6
5HI029	Within	586.0	589.3	604.2	607.5

A-1.5.4 Borehole Completion

Abandonment activities for Borehole ICPP-1797 began on August 26, 2003. Dynatec drilling used a Longyear LF-70 drill rig advancing a 3-in.-diameter tri-cone bit on "N" sized drill rod to clean the borehole of collapsed material. "Quick-grout" slurry (800 gal) was pumped into the borehole through the drill string after the borehole was cleaned to TD. Coated bentonite pellets (75 gal) were tremmied into the borehole. Two hundred eighty-eight bags of bentonite casing seal were then placed into the borehole. Seven bags of cement were mixed into a cement grout slurry to fill the upper portion of the borehole. A concrete pad with a brass survey marker was installed to mark the abandoned borehole's location. Depths of completion materials were not measured.

The following materials were used:

- "Quick Grout"—16 bags
- Coated bentonite pellets—75 gal
- Casing seal—288 bags, 50 lb each
- Cement—7 bags.

A-1.5.5 Geological Observations

Lithologic logs and geophysical logs for Borehole ICPP-1797 are included in Appendix A-A, and core photos are included on a CD attached to this report.

A-1.6 ICPP-1798—South Boring

A-1.6.1 Borehole Location

Borehole coordinates are available at the INEEL Hydrologic Data Repository.

A-1.6.2 Drilling Activity

A-1.6.2.1 Surface Casing. Drilling began of Borehole ICPP-1798 on August 1, 2002. A Schram Model 685W air rotary rig using a 28-in.-diameter solid-stem single-flight auger on 24 ft of drill rod set the surface casing. The borehole was advanced approximately 18 ft below land surface, where basalt was encountered. A 16-in. outside diameter, 1/4-in. wall casing was placed into the 28-in.-diameter borehole after removing the auger flight. Cement grout and bentonite were placed in the annular space around the outside of the 16-in. casing.

A-1.6.2.2 Vadose Zone. Borehole ICPP-1798 was drilled below the alluvium by a Schram Model 685W air rotary drill rig starting on August 2, 2002. A 10-in.-diameter borehole was advanced to 27 ft below land surface and 8-in. inside diameter carbon-steel threaded casing was set at that depth. The annular space between the 8- and 16-in. casing was filled with bentonite (Holeseal). A 6-in.-diameter downhole pneumatic hammer and a 6-3/4-in.-diameter bit then advanced the borehole, using water and air as the drilling fluid. Drilling to 465 ft below ground surface was completed on August 8, 2002, and the bit was tripped out. All drill cuttings from the vadose zone were placed in a 5,000-gal-capacity fractionation tank. Samples collected during drilling were composited for gamma analysis. A gamma spectrometer analysis performed on the sample (Sample Number JAD-54-02) at the INEEL Radioactive

Materials Laboratory on September 3, 2002, found no anthropocentric gamma-emitting radionuclides. The drill cuttings met INEEL release criteria and were used to level and grade the borehole pad area.

A-1.6.2.3 Saturated Zone. The location of Borehole ICPP-1798 is outside of the listed waste plume originating at the INTEC facility. Therefore, drill cuttings and water generated from the saturated zone were determined to not contain Resource Conservation and Recovery Act listed waste.

Borehole ICPP-1798 coring began on September 4, 2002. A UDR 1000 rig advanced a CHD 134 size core bit (approximately 5-1/2-in. outside diameter). On September 9, 2002, the CHD 134 bit was removed, a casing shoe attached to the bottom of the drill string and set at 532 ft below land surface. Coring then continued with an "H" size (3.8-in.-diameter) core bit. The top of the HI interbed was encountered at 619 ft below land surface. Attempts to core into the interbed were unsuccessful due to heaving sand and silt conditions. The hole was over reamed, and the CHD 134 drill string with shoe was advanced to serve as temporary casing.

Coring at ICPP-1798 was temporarily stopped on September 18 at 634 ft below land surface. Coring resumed on October 23, 2002. When the "H" size core bit was advanced approximately 10 ft below the CHD 134 rods, heaving sands became problematic and made advancement of the borehole impossible. Therefore, a "leap frog" drilling process was used in which the CHD 134 rods with the casing shoe were advance to the bottom of the "H" bit as temporary casing. It was then possible to advance the "H" bit approximately 10 ft below the temporary casing, where heaving sands would once again become problematic. Then, the temporary casing was once again advanced to the bit depth and the process began again. This process was repeated to the final depth of the interbed within the borehole.

Core rods and bit were dropped and successfully retrieved from the borehole on two occasions. The bottom of the interbed was encountered at 678 ft below land surface on October 30, 2002. The corehole was advanced to 723.6 ft below land surface on November 11, 2002.

A-1.6.3 Sampling

A downhole bailer was used to collect water samples from within the HI interbed on October 28, 2002. Groundwater samples were collected when the corehole was drilled approximately one half way through the interbed, with temporary casing sealing off all zones above the interbed. When samples were collected from below the HI interbed on November 5, 2002, casing was present through the entire depth of the interbed. An attempt to withdraw the temporary casing to the piezometric surface was unsuccessful due to the heaving nature of the interbed binding against the casing exterior. The casing was cut off at 590 ft below land surface using a mechanical downhole cutter. Groundwater sampling of zones above the HI interbed was accomplished on November 8, 2002. A straddle packer assembly was used to sample discrete zones within the SRPA. Sample zones and associated sample numbers are shown in Table A-4.

Table A-4. Straddle packer sampling for Borehole ICPP-1798.

Sample Series Number	Sample Description	Depth to Top of Upper Packer (ft)	Depth to Bottom of Upper Packer (ft)	Depth to Top of Lower Packer (ft)	Depth to Bottom of Lower Packer (ft)
5HI033	Zone 1	—	604.0	613.0	—
5HI034	Zone 2	507.0	—	—	—
5HI035	Zone 3	507.5	510.8	525.7	529.0
5HI036	Zone 4	524.6	527.9	542.8	546.1
5HI037	Zone 5	549.3	552.6	567.5	570.8
5HI038	Zone 6	569.9	573.2	588.1	591.4
5HI042	Zone 10	696.0	699.0	—	—
5HI043	Above	548.8	552.1	567.0	570.3
5HI044	Below	696.0	699.0	—	—
5HI045	Within	—	604.0	613.0	—

A-1.6.4 Borehole Completion

Cleaning of Borehole ICPP-1798 began on September 10, 2003, with a Longyear LF-70 core rig. An "H" sized corebit was advanced to the total drilled depth of 723 ft to clear bridged material from the borehole. A 1-1/2-in.-diameter polyvinyl chloride (PVC) piezometer with 3-ft-long screen was placed in the borehole with the screen set at 719 to 722 ft below land surface. Silica sand (8-12) was emplaced from the borehole bottom to 714 ft below land surface. Bentonite was then placed into the borehole to 625 ft below land surface. The drilling subcontractor then attempted to run the drill string and bit back into the hole over the PVC casing to clear a bridge in the hole. The PVC casing was broken during the attempt to run the bit over the PVC casing. The borehole was then backfilled with bentonite to 527 ft below land surface, and another 1-1/2-in.-diameter PVC piezometer was set with the screen zone from 520 to 523 ft below land surface. Silica sand (8-12 size) was placed from 523 to 520 ft below land surface, and 10-20 sand was placed from 520 to 508 ft below land surface. Bentonite was then placed from 508 ft to the land surface. A protective wellhead enclosure, concrete well pad, and impingement posts were installed at the wellhead, with a 2-ft stickup. Field activities were completed on September 22, 2003.

The following materials were used:

- Bentonite casing seal—376 bags, 50 lb each
- Bentonite hole plug—49 bags, 50 lb each
- Silica sand—12 bags (8-12 mesh) and 13-½ bags (10-20 mesh).

A-1.6.5 Geological Observations

Lithologic logs and geophysical logs for Borehole ICPP-1798 are included in Appendix A-A, and core photos are included on a CD attached to this report.

Appendix A-A
Boring Logs

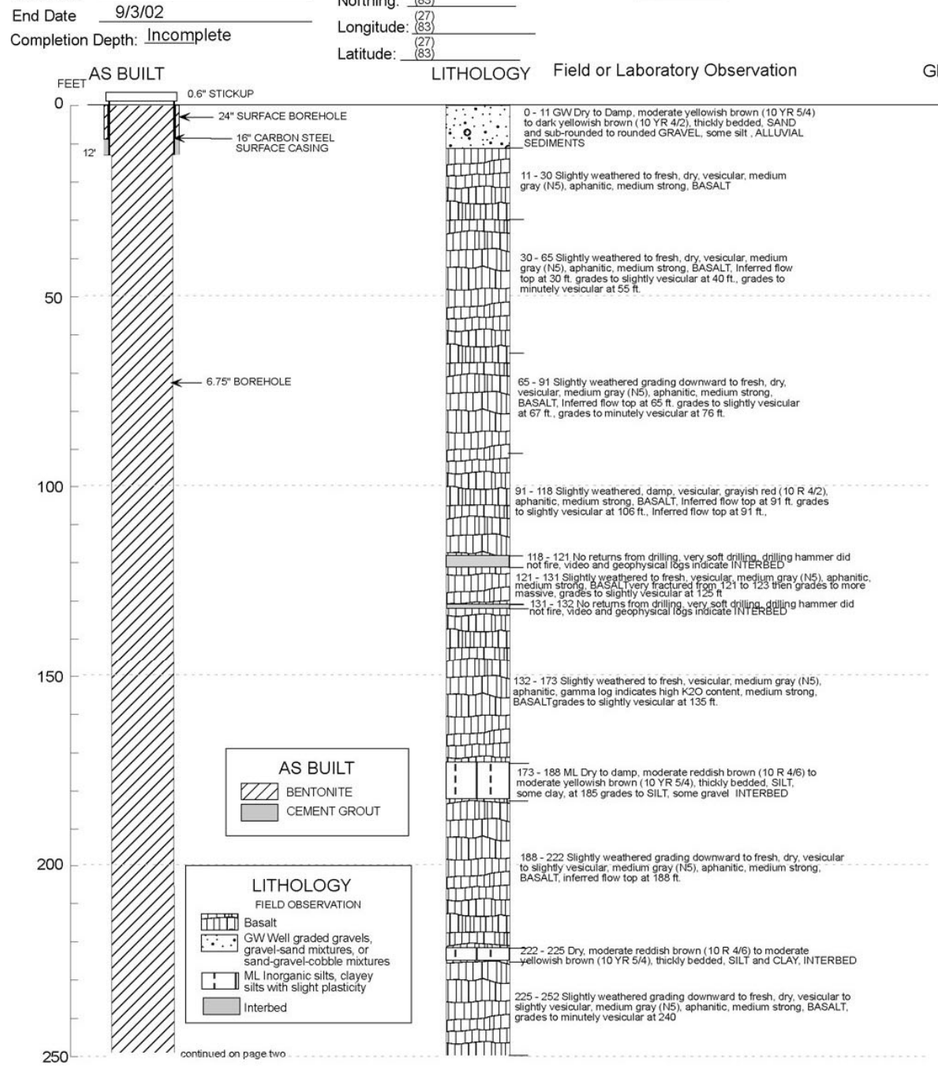
WELL NAME: **ICPP-1795**
Facility: INTEC
Well Type: Corehole
Well Status: Abandoned
Year Drilled: 2002
Total Depth: 647.8'
Start Date: 7/19/02
End Date: 9/3/02
Completion Depth: Incomplete

Brass Cap
Easting: (27) (83)
Northing: (27) (83)
Longitude: (27) (83)
Latitude: (27) (83)

Measuring Point
Easting: (27) (83)
Northing: (27) (83)
Longitude: (27) (83)
Latitude: (27) (83)

Driller: Dynatec
Geologist: A. Bailey, S. Smith (MSE)
Drill Method: Air rotary, Wireline Core
Drill Fluid: Air/water
Land Surface: (29)BC (88)BC (29)MP (88)MP

Todays Date: 1/14/03
Water Level:
Water Level Date:
Water Level Access:



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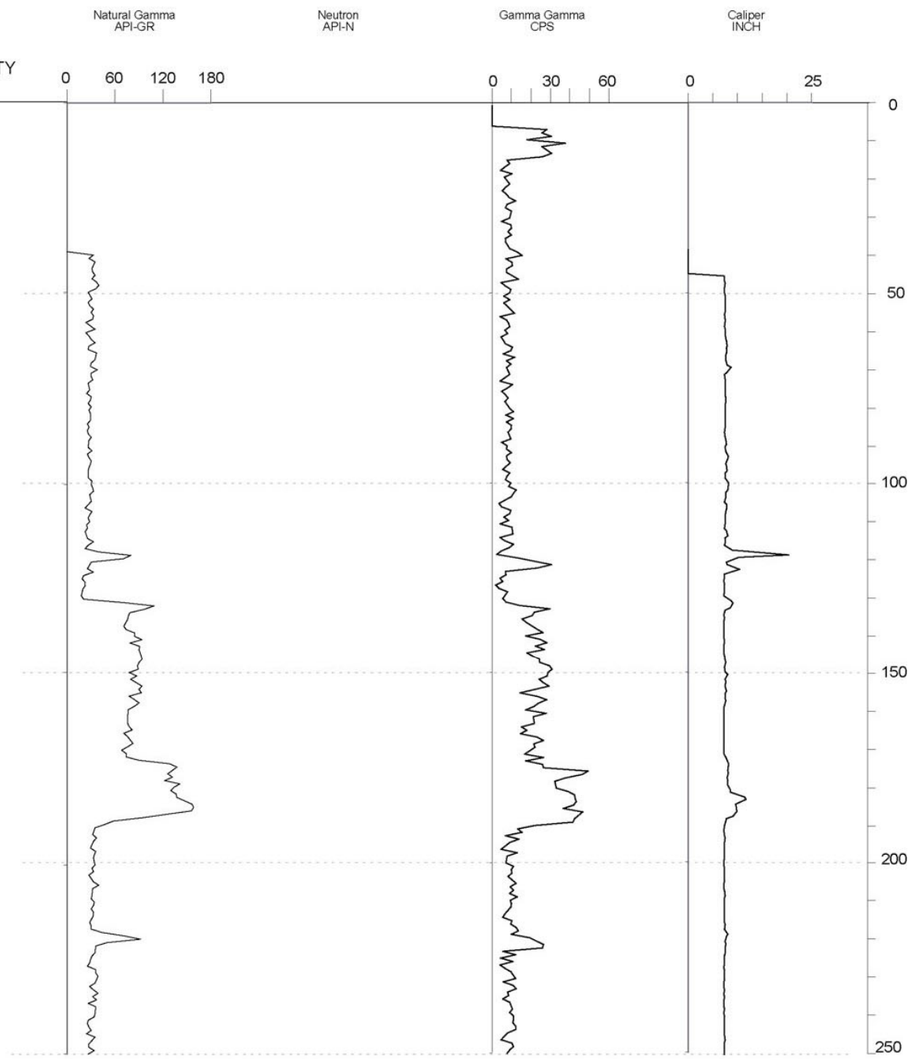


WELL NAME: ICPP-1795 PG 2)
Facility: INTEC
Well Type: Corehole
Well Status: Abandoned
Year Drilled: 2002
Total Depth: 647.8'
Start Date: 7/19/02
End Date: 9/3/02
Completion Depth: Incomplete

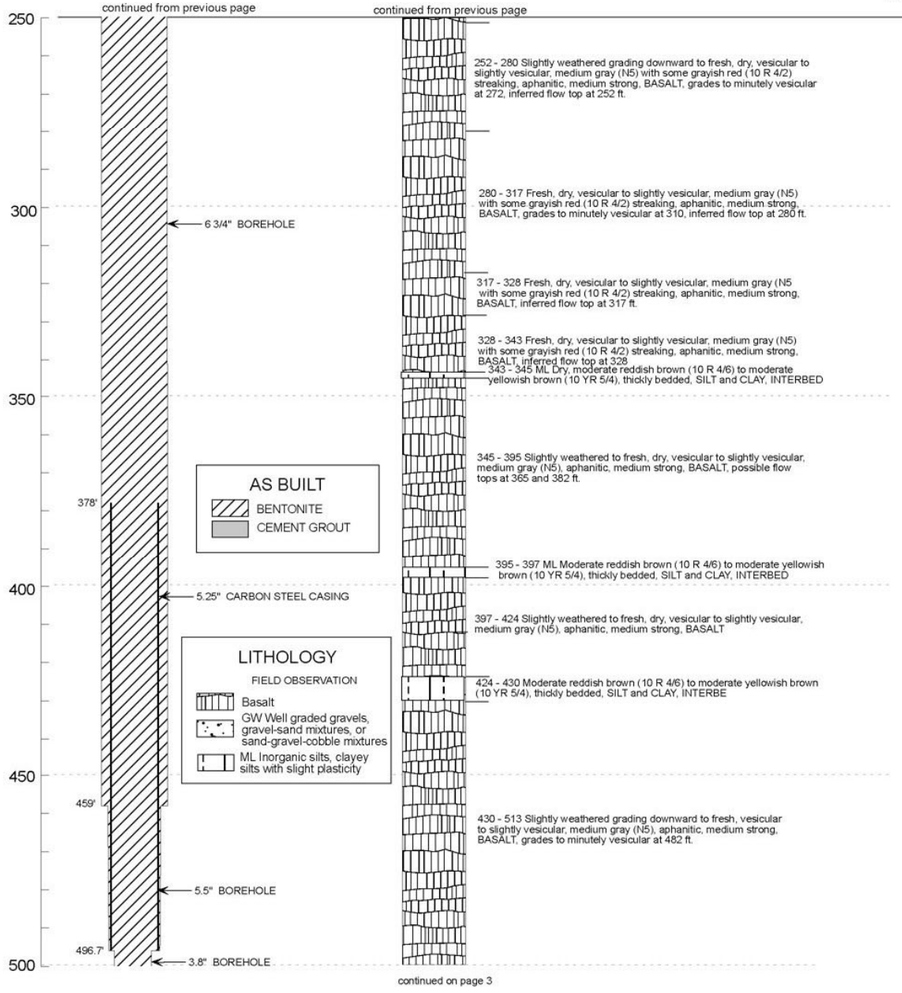
Brass Cap
Easting: (27) (83)
Northing: (27) (83)
Longitude: (27) (83)
Latitude: (27) (83)

Measuring Point
Easting: (27) (83)
Northing: (27) (83)
Longitude: (27) (83)
Latitude: (27) (83)

Driller: Dynatec
Geologist: A. Bailey, S. Smith (MSE)
Drill Method: Air rotary, Wireline Core
Drill Fluid: Air/water
Land Surface: (29)BC (88)BC (29)MP (88)MP

Todays Date: 1/14/03
Water Level:
Water Level Date:
Water Level Access:

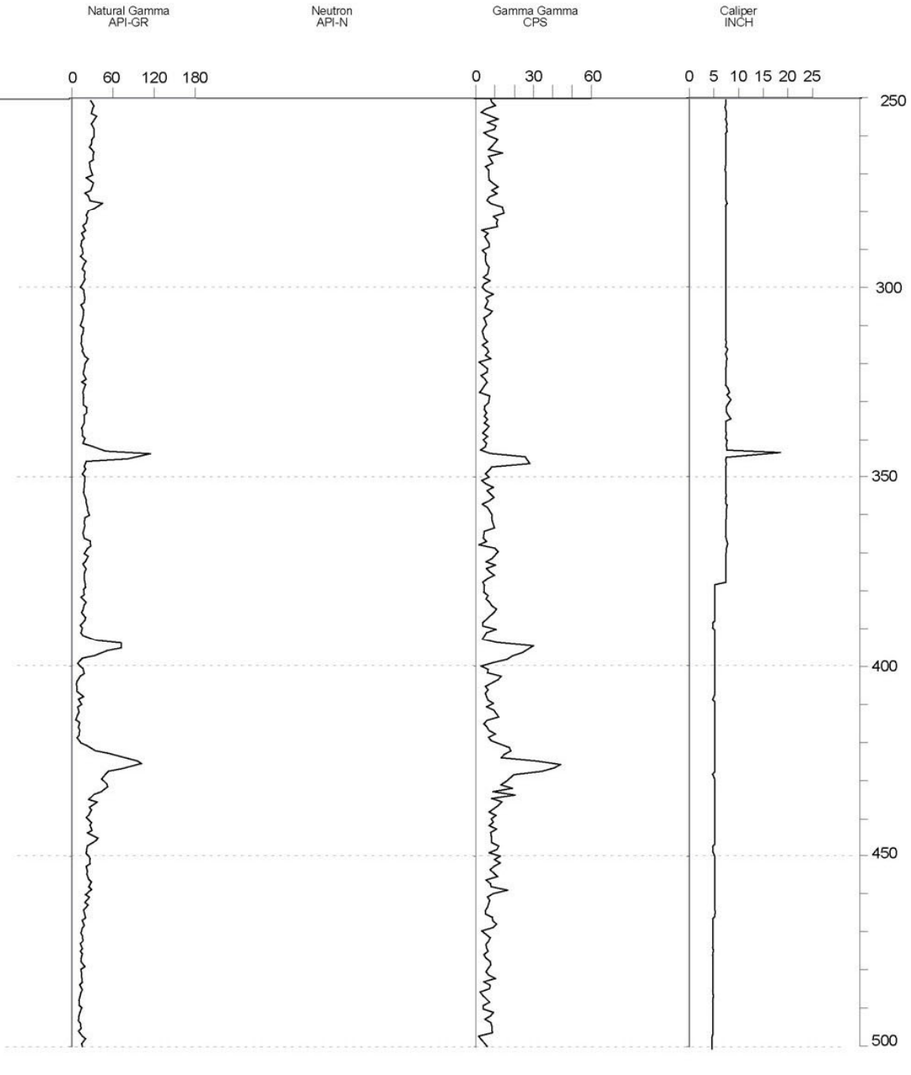
AS BUILT



LITHOLOGY

Field or Laboratory Observation

GROUNDWATER QUALITY RESULTS (pCi/L)



WELL NAME: **ICPP-1795 PG 3**
Facility: INTEC
Well Type: Corehole
Well Status: Abandoned
Year Drilled: 2002
Total Depth: 647.8'
Start Date: 7/19/02
End Date: 9/3/02
Completion Depth: Incomplete

Brass Cap
Easting: (27) (83)
Northing: (27) (83)
Longitude: (27) (83)
Latitude: (27) (83)

Measuring Point
Easting: (27) (83)
Northing: (27) (83)
Longitude: (27) (83)
Latitude: (27) (83)

Driller: Dynatec
Geologist: A. Bailey, S. Smith (MSE)
Drill Method: Air rotary, Wireline Core
Drill Fluid: Air/water
Land Surface: (29)BC (88)BC (29)MP (88)MP

Todays Date: 1/14/03
Water Level:
Water Level Date:
Water Level Access:

AS BUILT

FEET

continued from previous page

3.8" OPEN BOREHOLE

BENTONITE
CEMENT GROUT

LITHOLOGY

continued from previous page

513 - 541 Fresh, vesicular to slightly vesicular, grayish red (10 R 4/2), aphanitic, medium strong, BASALT, at 518 ft. grades to minutely vesicular with occasional horizontal vesicle bands, inferred flow top at 513 ft, possible flow contact at 535 ft.

541 - 556 Slightly weathered, vesicular, dark reddish brown (10 R ¾ -when wet), aphanitic, medium strong, BASALT, at 545 grades to medim gray (N5), , at 549 grades to slightly vesicular and strong, at 552 grades to minutely vesicular, inferred flow top at 541 ft.

S1

556 - 587 Slightly weathered, vesicular, grayish red (5 R 4/2), aphanitic, medium strong, BASALT, at 560 grades to medim gray (N5), , at 570 grades to minutely vesicular and strong, 560 to 568 ft. zone is highly fractured with significant clay and caliche infillings, inferred flow top at 556 ft.

S2

587 - 594 ML Pale yellowish brown (10 YR 6/2) to dark yellowish brown (10 YR 4/2), structureless, medium to fine grained, SAND and SILT, trace clay, grading downward to SILT and CLAY with trace to little sub-rounded to rounded gravel, trace sand
** 591-591.9 USDA Loam, ML*
** 593.8-594.2 USDA Sandy loam, SC*

S3

594 - 633 Slightly weathered grading downward to fresh, vesicular, medium dark gray (N5) to medium gray (N4), aphanitic with occasional diktyaxitic zones, up to 3 mm long lath shaped phenocrysts of plagioclase, medium strong to strong, BASALT, grades to slightly vesicular at 596 ft., grades to minutely vesicular at 618 ft.

633 - 646 Fresh, vesicular, medium dark gray (N5) to medium gray (N4), aphanitic with occasional diktyaxitic zones, up to 5 mm long lath shaped phenocrysts of plagioclase, medium strong to strong, BASALT, inferred flow top at 633 ft.

646 - TD(TD 647.8) Fresh, vesicular, medium dark gray (N5) to medium gray (N4), aphanitic, medium strong to strong, BASALT

Total Depth 647.8'

Field or Laboratory Observation

GROUNDWATER QUALITY RESULTS (pCi/L)

S1 Sample Depth 560'

H-3	11,100 ± 316	
Sr-90	3.72 ± 0.50	
I-129	0.59 ± 0.36	U
I-129	0.34 ± 0.04	
Tc-99	6.95 ± 1.44	J
Tc-99	6.92 ± 1.55	J

S2 Sample Depth 590'

H-3	7170 ± 261	
Sr-90	4.11 ± 0.62	
I-129	1.26 ± 0.47	UJ
I-129	0.38 ± 0.05	
Tc-99	13.70 ± 1.93	
Tc-99	14.10 ± 1.90	

S3 Sample Depth 620'

H-3	6370 ± 254	
Sr-90	7.41 ± 0.92	
I-129	0.00 ± 0.28	U
I-129	0.43 ± 0.07	
Tc-99	17.70 ± 1.70	
Tc-99	13.40 ± 1.58	

Natural Gamma API-GR: 0 60 120 180
Neutron API-N
Gamma Gamma CPS: 0 30 60
Caliper INCH

500
550
600
650
700
750

LITHOLOGY

S1 ■ Sample interval

FIELD OBSERVATION

Basalt
GW Well graded gravels, gravel-sand mixtures, or sand-gravel-cobble mixtures
ML Inorganic silts, clayey silts with slight plasticity

GATHERED OR INFERRED FROM LABORATORY OBSERVATION

** ASTM Poorly-graded sand with gravel, SP*

WELL NAME: **ICPP-1796**
Facility: INTEC
Well Type: Corehole
Well Status: Abandoned
Year Drilled: 2002
Total Depth: 663'
Start Date: 8/1/02
End Date: 10/10/02
Completion Depth: Incomplete

Brass Cap
Easting: (27) (83)
Northing: (27) (83)
Longitude: (27) (83)
Latitude: (27) (83)

Measuring Point
Easting: (27) (83)
Northing: (27) (83)
Longitude: (27) (83)
Latitude: (27) (83)

Driller: Dynatec
Geologist: A. Bailey, S. Smith (MSE)
Drill Method: Air rotary, Wireline Core
Drill Fluid: Air/water
Land Surface: (29)BC (88)BC (29)MP (88)MP

Todays Date: 1/14/03
Water Level:
Water Level Date:
Water Level Access:

continued on page two
continued on page 2

WELL NAME: **ICPP-1796 PG 2**
Facility: INTEC
Well Type: Corehole
Well Status: Abandoned
Year Drilled: 2002
Total Depth: 663'
Start Date: 8/1/02
End Date: 10/10/02
Completion Depth: Incomplete

Brass Cap
Easting: (27) (83)
Northing: (27) (83)
Longitude: (27) (83)
Latitude: (27) (83)

Measuring Point
Easting: (27) (83)
Northing: (27) (83)
Longitude: (27) (83)
Latitude: (27) (83)

Driller: Dynatec
Geologist: A. Bailey, S. Smith (MSE)
Drill Method: Air rotary, Wireline Core
Drill Fluid: Air/water
Land Surface: (29)BC (88)BC (29)MP (88)MP

Todays Date: 1/14/03
Water Level:
Water Level Date:
Water Level Access:

AS BUILT

continued from previous page

6 3/4" OPEN BOREHOLE

BENTONITE
CEMENT GROUT

LITHOLOGY

S1 ■ Sample interval

FIELD OBSERVATION

Basalt
GW Well graded gravels, gravel-sand mixtures, or sand-gravel-cobble mixtures

LITHOLOGY

continued from previous page

257 - 271 Slightly weathered grading downward to fresh, dry, vesicular, grayish red (10 R ¾) grading downward to medium gray (N5), aphanitic, medium strong, BASALT; grades to slightly vesicular at 263 ft., inferred flow top at 257 ft.

271 - 325 Slightly weathered grading downward to fresh, dry, vesicular, grayish red (10 R ¾) grading downward to medium gray (N5), aphanitic, medium strong, BASALT, grades to slightly vesicular at 243 ft., grades to minutely vesicular at 320

325 - 355 Slightly weathered grading downward to fresh, vesicular to slightly vesicular, medium gray (N5) with some grayish red (10 R 4/2) streaking, aphanitic, medium strong, BASALT, vesicles from 325 to 327 contain moderate yellowish brown (10 YR 5/4) infillings.

355 - 385 No returns from drilling, very soft drilling, drilling hammer did not fire, video and geophysical logs indicate INTERBED, video log indicates GRAVEL and SAND.

385 - 400 Fresh, vesicular to slightly vesicular, medium gray (N5), aphanitic, medium strong, BASALT

400 - 431 Fresh, vesicular to slightly vesicular, medium gray (N5), aphanitic, medium strong, BASALT, inferred flow top at 400 ft.

431 - 454 Very few returns from drilling, very soft drilling, drilling hammer did not fire, video and geophysical logs indicate INTERBED, video log and recovered cuttings indicates GRAVEL and SAND.

454 - 476 Slightly weathered grading downward to fresh, vesicular, medium gray (N5), aphanitic, medium strong, BASALT

476 - 486 Slightly weathered grading downward to fresh, vesicular, grayish red (5 R 4/2), aphanitic, medium strong, BASALT, grades to medium gray (N5) at 483 ft., grades to slightly vesicular at 484 ft.

S1

486 - 523 Slightly weathered to fresh, dry, vesicular to slightly vesicular, medium gray (N5), aphanitic, medium strong, BASALT, 486 to 502 is very highly fractured.

continued on page 3

Field or Laboratory Observation

GROUNDWATER QUALITY RESULTS (pCi/L)

S1 Sample Depth 485'

H-3	6380 ± 253	
H-3	5400 ± 218	
Sr-90	8.33 ± 1.06	
Sr-90	8.86 ± 1.18	
I-129	0.00 ± 0.51	U
I-129	0.57 ± 0.26	UJ

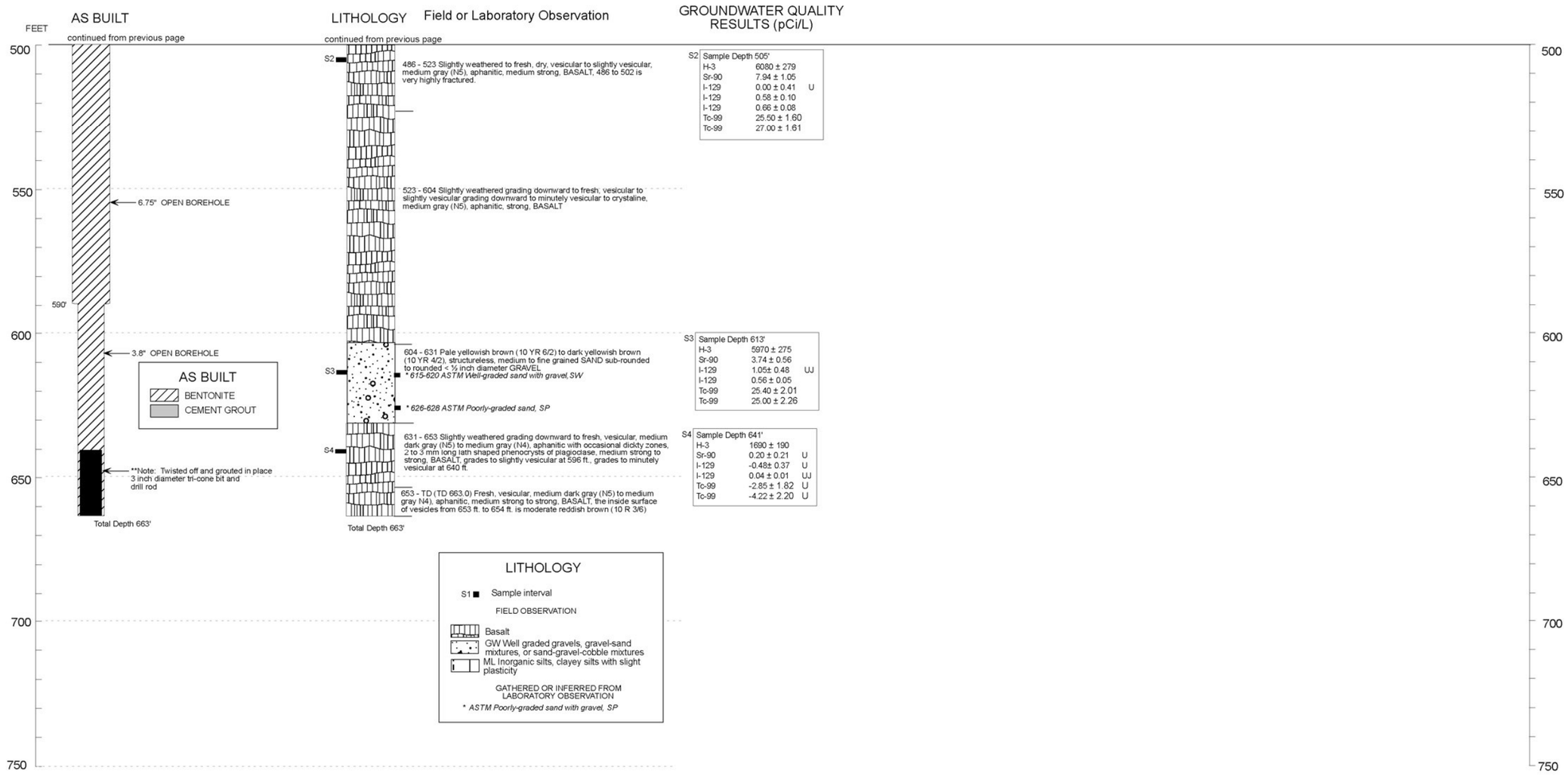
WELL NAME: **ICPP-1796 PG 3**
Facility: INTEC
Well Type: Corehole
Well Status: Abandoned
Year Drilled: 2002
Total Depth: 663'
Start Date: 8/1/02
End Date: 10/10/02
Completion Depth: Incomplete

Brass Cap
Easting: (27) (83)
Northing: (27) (83)
Longitude: (27) (83)
Latitude: (27) (83)

Measuring Point
Easting: (27) (83)
Northing: (27) (83)
Longitude: (27) (83)
Latitude: (27) (83)

Driller: Dynatec
Geologist: A. Bailey, S. Smith (MSE)
Drill Method: Air rotary, Wireline Core
Drill Fluid: Air/water
Land Surface: (29)BC (88)BC (29)MP (88)MP

Todays Date: 1/14/03
Water Level:
Water Level Date:
Water Level Access:



WELL NAME: **ICPP-1797**
Facility: INTEC
Well Type: Corehole
Well Status: Abandoned
Year Drilled: 2002
Total Depth: 647.6'
Start Date: 7/19/02
End Date: 10/17/02
Completion Depth: Incomplete

Brass Cap
Easting: (27) (83)
Northing: (27) (83)
Longitude: (27) (83)
Latitude: (27) (83)

Measuring Point
Easting: (27) (83)
Northing: (27) (83)
Longitude: (27) (83)
Latitude: (27) (83)

Driller: Dynatec
Geologist: A. Bailey, S. Smith (MSE)
Drill Method: Air rotary, Wireline Core
Drill Fluid: Air/water
Land Surface: (29)BC (88)BC (29)MP (88)MP

Todays Date: 1/17/03
Water Level:
Water Level Date:
Water Level Access:

AS BUILT

FEET
0
50
100
150
200
250

0.6" STICKUP
24" SURFACE BOREHOLE
16" CARBON STEEL SURFACE CASING
11'
6.75" OPEN BOREHOLE

AS BUILT
BENTONITE
CEMENT GROUT

LITHOLOGY
FIELD OBSERVATION
Basalt
GW Well graded gravels, gravel-sand mixtures, or sand-gravel-cobble mixtures
ML Inorganic silts, clayey silts with slight plasticity
Interbed

continued on page two

LITHOLOGY

0 - 11 GW Dry to damp, moderate yellowish brown (10 YR 5/4) to dark yellowish brown (10 YR 4/2), thickly bedded, SAND and sub-rounded to rounded GRAVEL, some silt , ALLUVIAL SEDIMENTS

11 - 52 Slightly weathered to fresh, dry, vesicular, medium gray (N5), aphanitic, medium strong, BASALT, gravel infilling in fractures from 11 to 18 ft., very rubbley from 33 to 44 ft., possible flow contact at 40 ft.

52 - 120 Fresh, vesicular, medium gray (N5), aphanitic, medium strong, BASALT, fractured from 52 to 60 ft., at 64 ft. and at 78 ft., possible flow contact at 78 ft.

120 - 141 Fresh, vesicular, medium gray (N5), aphanitic, medium strong, BASALT, inferred flow top at 120 ft.

141 - 150 Slightly weathered to fresh, vesicular, medium gray (N5), aphanitic, gamma log may indicate a high K2O content, medium strong, BASALT, grades to slightly vesicular at 136 ft., very fractured from 141 to 145 ft., inferred flow top at 141

150 - 158 No returns from drilling, very soft drilling, drilling hammer did not fire, video and geophysical logs may indicate INTERBED

158 - 181 Few returns, but recovered material may indicate: Slightly weathered to fresh, vesicular, medium gray (N5), aphanitic, medium strong, BASALT

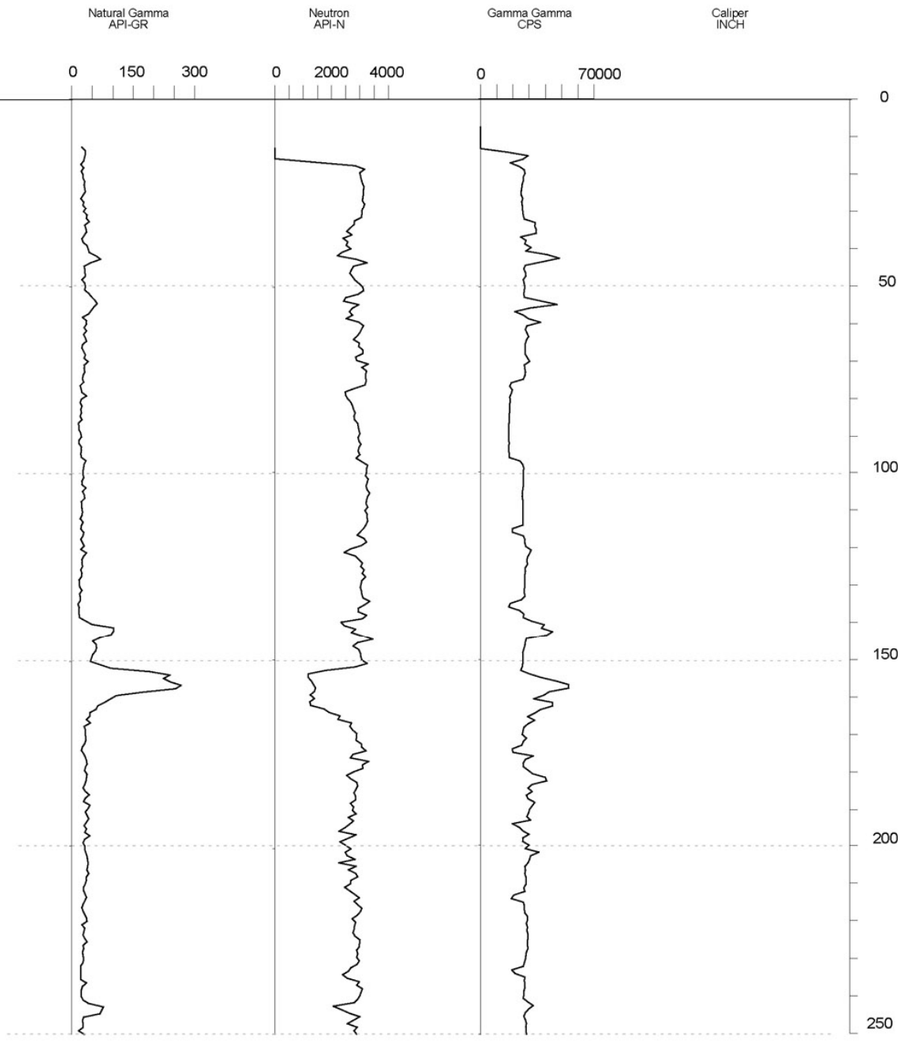
181 - 240 Few returns, but recovered material may indicate: Slightly weathered to fresh, vesicular, grayish red (10 R ¾) grading downward to medium gray (N5), aphanitic, medium strong, BASALT, possible flow contact at 202 ft.

240 - 242 No returns from drilling, very soft drilling, drilling hammer did not fire, video and geophysical logs may indicate INTERBED

242 - 284 Few returns, but recovered material may indicate: Slightly weathered to fresh, vesicular, medium gray (N5), aphanitic, medium strong, BASALT

continued on page 2

GROUNDWATER QUALITY RESULTS (pCi/L)



WELL NAME: **ICPP-1797 pg 2**
Facility: INTEC
Well Type: Corehole
Well Status: Abandoned
Year Drilled: 2002
Total Depth: 647.6'
Start Date: 7/19/02
End Date: 10/17/02
Completion Depth: Incomplete

Brass Cap
Easting: (27) (83)
Northing: (27) (83)
Longitude: (27) (83)
Latitude: (27) (83)

Measuring Point
Easting: (27) (83)
Northing: (27) (83)
Longitude: (27) (83)
Latitude: (27) (83)

Driller: Dynatec
Geologist: A. Bailey, S. Smith (MSE)
Drill Method: Air rotary, Wireline Core
Drill Fluid: Air/water
Land Surface: (29)BC (88)BC (29)MP (88)MP

Todays Date: 1/17/03
Water Level:
Water Level Date:
Water Level Access:

AS BUILT

continued from previous page

6 3/4" OPEN BOREHOLE

BENTONITE
CEMENT GROUT

LITHOLOGY

FIELD OBSERVATION

Basalt
GW Well graded gravels, gravel-sand mixtures, or sand-gravel-cobble mixtures
S1 Sample interval
GATHERED OR INFERRED FROM LABORATORY OBSERVATION
ASTM Poorly-graded sand with gravel, SP

LITHOLOGY

continued from previous page

242 - 284 Few returns, but recovered material may indicate: Slightly weathered to fresh, vesicular, medium gray (N5), aphanitic, medium strong, BASALT

284 - 336 Slightly weathered grading downward to fresh, vesicular, grayish red (10 R ¾) grading downward to medium gray (N5), aphanitic, medium strong, BASALT, inferred flow top at 284 ft.

336 - 363 Few returns, but recovered material may indicate: Slightly weathered to fresh, vesicular, medium gray (N5), aphanitic, medium strong, BASALT

363 - 378 GW Moderate reddish brown (10 R 4/6), thickly bedded, medium to coarse grained SAND and up to 1 inch diameter sub-angular to rounded GRAVEL, INTERBED

378 - 399 Slightly weathered grading downward to fresh, vesicular, medium gray (N5), aphanitic, medium strong, BASALT, grades to slightly vesicular at 268 ft.

399 - 406 Slightly weathered grading downward to fresh, vesicular, grayish red (10 R ¾) grading downward to medium gray (N5), aphanitic, medium strong, BASALT

406 - 440 Slightly weathered to fresh, vesicular, grayish red (10 R ¾) grading downward to medium gray (N5), aphanitic, medium strong, BASALT, very fractured from 327 to 342 ft with vertical fractures extending downward to 348 ft., very fractured (possible flow top) from 426 to 430 ft., inferred flow top at 406 ft.

440 - 448 GW Moderate yellowish brown (10 YR 5/4) to moderate reddish brown (10 R 4/6), thickly bedded, medium to coarse grained SAND with 1 to 2 ft. thick zones of (<1 inch diameter) sub-angular to rounded GRAVEL and SAND, INTERBED

448 - 460 Few returns, but recovered material may indicate: Slightly weathered to fresh, vesicular, medium gray (N5), aphanitic, medium strong, BASALT

460 - 478 Few returns, but recovered material may indicate: Slightly weathered to fresh, vesicular, medium gray (N5), aphanitic, medium strong, BASALT, video log indicates flow break at 478 ft.

S1

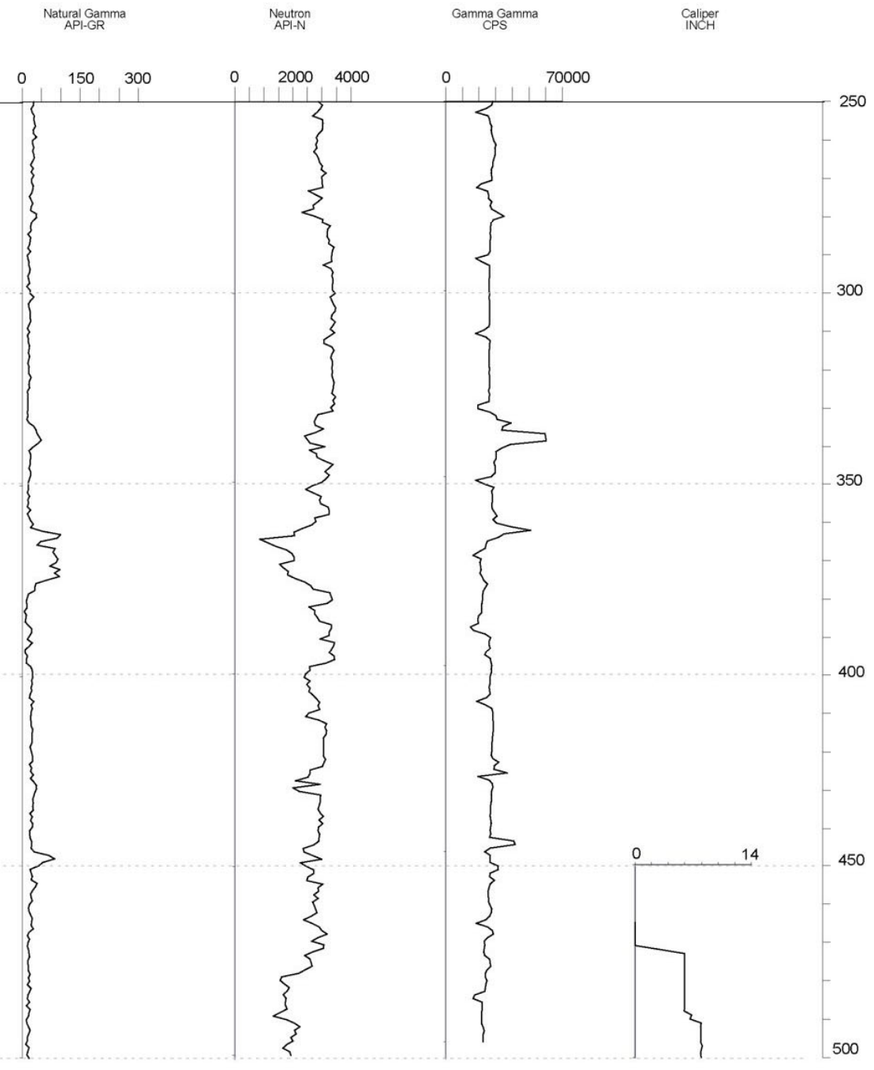
478 - 557 Slightly weathered grading downward to fresh, vesicular, medium gray (N5), aphanitic, medium strong, BASALT, many fractures from 478 to 490 ft., fractures rom 495 to 497 ft., vertical fractures at 515 ft., 524 ft., and at 552 ft., possible flow break at 495 ft., inferred flow top at 435 ft. based on video log

S2

continued on page 3

GROUNDWATER QUALITY RESULTS (pCi/L)

S1	Sample Depth 472-503'		
	H-3	7330 ± 273	
	Sr-90	5.35 ± 0.77	
	I-129	1.74 ± 0.62	U
	Tc-99	28.70 ± 2.24	
	Tc-99	39.40 ± 2.91	
S2	Sample Depth 480-503'		
	I-129	0.88 ± 0.08	J



WELL NAME: **ICPP-1797 pg 3**
Facility: INTEC
Well Type: Corehole
Well Status: Abandoned
Year Drilled: 2002
Total Depth: 647.6'
Start Date: 7/19/02
End Date: 10/17/02
Completion Depth: Incomplete

Brass Cap
Easting: (27) (83)
Northing: (27) (83)
Longitude: (27) (83)
Latitude: (27) (83)

Measuring Point
Easting: (27) (83)
Northing: (27) (83)
Longitude: (27) (83)
Latitude: (27) (83)

Driller: Dynatec
Geologist: A. Bailey, S. Smith (MSE)
Drill Method: Air rotary, Wireline Core
Drill Fluid: Air/water
Land Surface: (29)BC (88)BC (29)MP (88)MP

Todays Date: 1/17/03
Water Level:
Water Level Date:
Water Level Access:

AS BUILT

FEET

continued from previous page

6.75" OPEN BOREHOLE

5.5" OPEN BOREHOLE

616.5'

3.8" OPEN BOREHOLE

Total Depth 647.6'

LITHOLOGY

Field or Laboratory Observation

continued from previous page

S3
S4 478 - 557 Slightly weathered grading downward to fresh, vesicular, medium gray (N5), aphanitic, medium strong, BASALT, many fractures from 478 to 490 ft., fractures rom 495 to 497 ft., vertical fractures at 515 ft., 524 ft., and at 552 ft., possible flow break at 495 ft., inferred flow top at 435 ft. based on video log
S5 557 - 583 Few returns, but recovered material may indicate: Slightly weathered to fresh, vesicular, medium gray (N5), aphanitic, medium strong, BASALT, possible flow break at 573 ft.
S6 583 - 585 Very few returns from drilling, very soft drilling, recovered some 1 inch diameter subrounded to rounded GRAVEL, possible INTERBED
585 - 595 Slightly weathered grading downward to fresh, vesicular, medium gray (N5), aphanitic, medium strong, BASALT, grades to slightly vesicular by 591 ft.
S7 595 - 601 Fresh, vesicular, medium dark gray (N4), aphanitic, medium strong, BASALT, grades to medium gray (N4) at 598 ft., fractures from 595 to 600 have caliche and clay infillings and coatings.
* *604-605 ASTM Poorly-graded sand, SP*
* *607 ASTM Poorly-graded gravel w/sand, GP*
HI Interbed 601-617 GM Moderate reddish brown (10 R 4/6), structureless, medium to fine grained SAND and sub-rounded to rounded < 1 inch diameter GRAVEL, some silt.
* *614 USDA Sandy loam, SC*
617 - 630 Fresh, vesicular, medium dark gray (N4) to medium gray (N4), aphanitic with occasional dickty zones, 2 to 3 mm long lath shaped phenocrysts of plagioclase, medium strong to strong, BASALT, grades to minutely vesicular at 621 ft., fractures from 625 to 627 ft. are coated with caliche.
S8
S9 630 - 642 Fresh, slightly vesicular to vesicular, moderate reddish brown (10 R 4/4) grading downward to medium gray (N5), aphanitic, medium strong, BASALT
642 - TD(TD 647.6) Fresh, vesicular, dark grayish red (5 R 3/2) to dark brownish gray (5 YR 3/1) grading downward to medium dark gray (N4), aphanitic, medium strong, BASALT

Total Depth 647.6'

GROUNDWATER QUALITY RESULTS (pCi/L)

S3	Sample Depth 506-521'		
	H-3	7150 ± 270	
	Sr-90	4.61 ± 0.56	
	I-129	0.74 ± 0.25	UJ
S4	Sample Depth 522-537'		
	H-3	7000 ± 268	
	Sr-90	5.09 ± 0.65	
	I-129	1.28 ± 0.54	UJ
S5	Sample Depth 551-567'		
	H-3	7840 ± 281	
	Sr-90	1.90 ± 0.27	
	I-129	0.08 ± 0.32	U
S6	Sample Depth 578-593'		
	H-3	8400 ± 291	
	Sr-90	1.15 ± 0.40	UJ
	I-129	0.28 ± 0.35	U
S7	Sample Depth 589-605'		
	H-3	6930 ± 266	
	Sr-90	4.48 ± 0.55	
	I-129	0.17 ± 0.38	U
	I-129	0.73 ± 0.06	J
	Tc-99	30.90 ± 2.76	
	Tc-99	33.20 ± 2.89	
S8	Sample Depth 632'		
	I-129	0.34 ± 0.05	J
S9	Sample Depth 636'		
	H-3	4010 ± 142	
	Sr-90	5.46 ± 0.72	
	I-129	0.55 ± 0.38	U
	Tc-99	22.80 ± 2.83	
	Tc-99	22.10 ± 2.89	

Natural Gamma API-GR: 0, 150, 300
Neutron API-N: 0, 2000, 4000
Gamma Gamma CPS: 0, 70000
Caliper INCH: 0, 14

500 550 600 650 700 750

AS BUILT
BENTONITE
CEMENT GROUT

LITHOLOGY
S1 ■ Sample interval
FIELD OBSERVATION
Basalt
GW Well graded gravels, gravel-sand mixtures, or sand-gravel-cobble mixtures
ML Inorganic silts, clayey silts with slight plasticity
GM Silty gravels, gravel-sand-silt mixtures
GATHERED OR INFERRED FROM LABORATORY OBSERVATION
* *ASTM Poorly-graded sand with gravel, SP*

WELL NAME: **ICPP-1798**
Facility: INTEC (USGS)
Well Type: Peizometer
Well Status: Active
Year Drilled: 2002
Total Depth: 723.6'
Start Date: 8/1/02
End Date: 9/03
Completion Depth: 523'

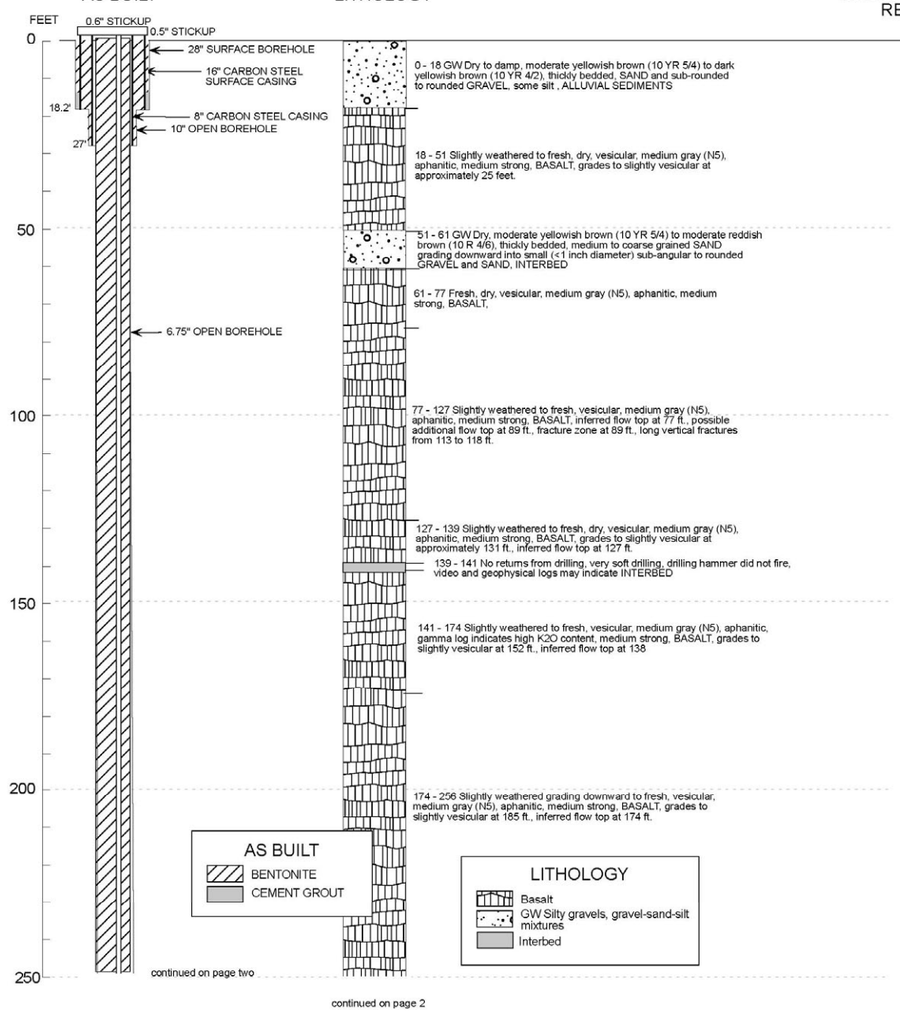
Brass Cap
Easting: (27) (83)
Northing: (27) (83)
Longitude: (27) (83)
Latitude: (27) (83)

Measuring Point
Easting: (27) (83)
Northing: (27) (83)
Longitude: (27) (83)
Latitude: (27) (83)

Driller: Dynatec
Geologist: A. Bailey, S. Smith (MSE)
Drill Method: Air rotary, Wireline Core
Drill Fluid: Air/water
Land Surface: (29)BC (88)BC (29)MP (88)MP

Todays Date: 1/30/03
Water Level:
Water Level Date:
Water Level Access:

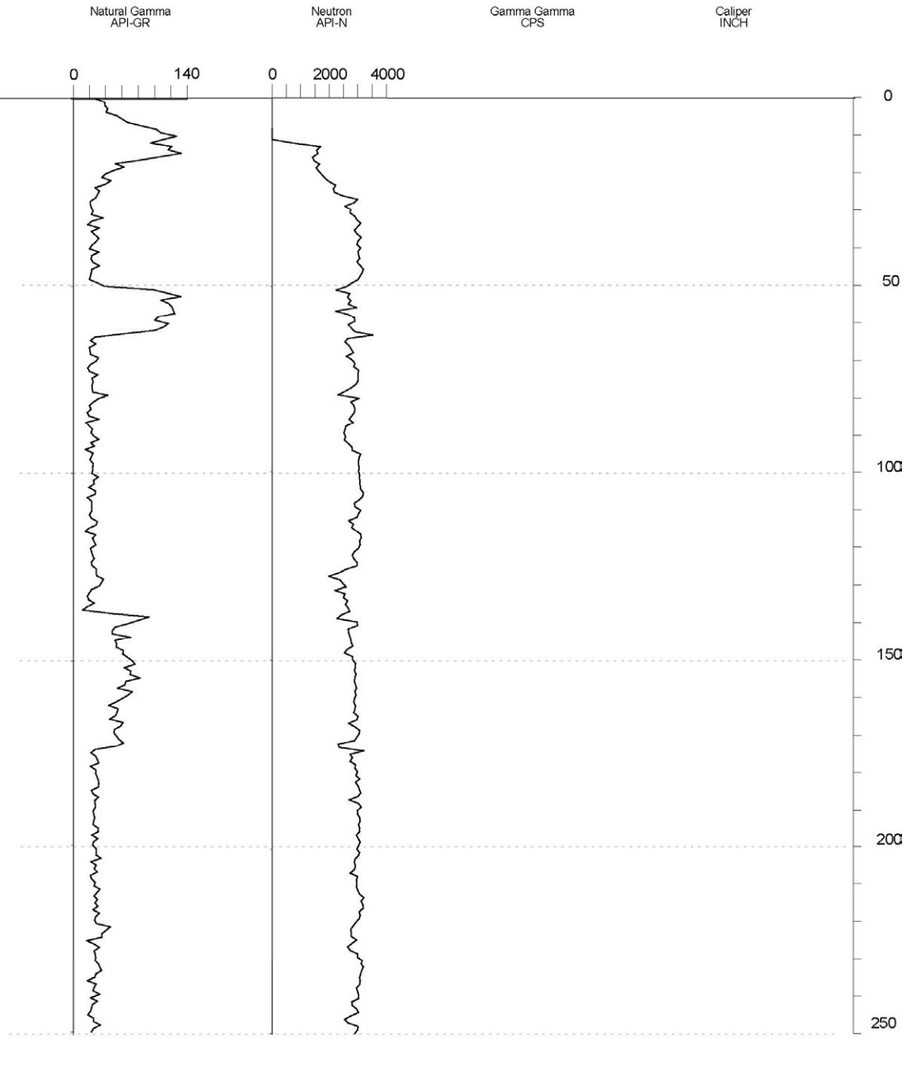
AS BUILT



LITHOLOGY

continued on page 2

GROUNDWATER QUALITY RESULTS (pCi/L)



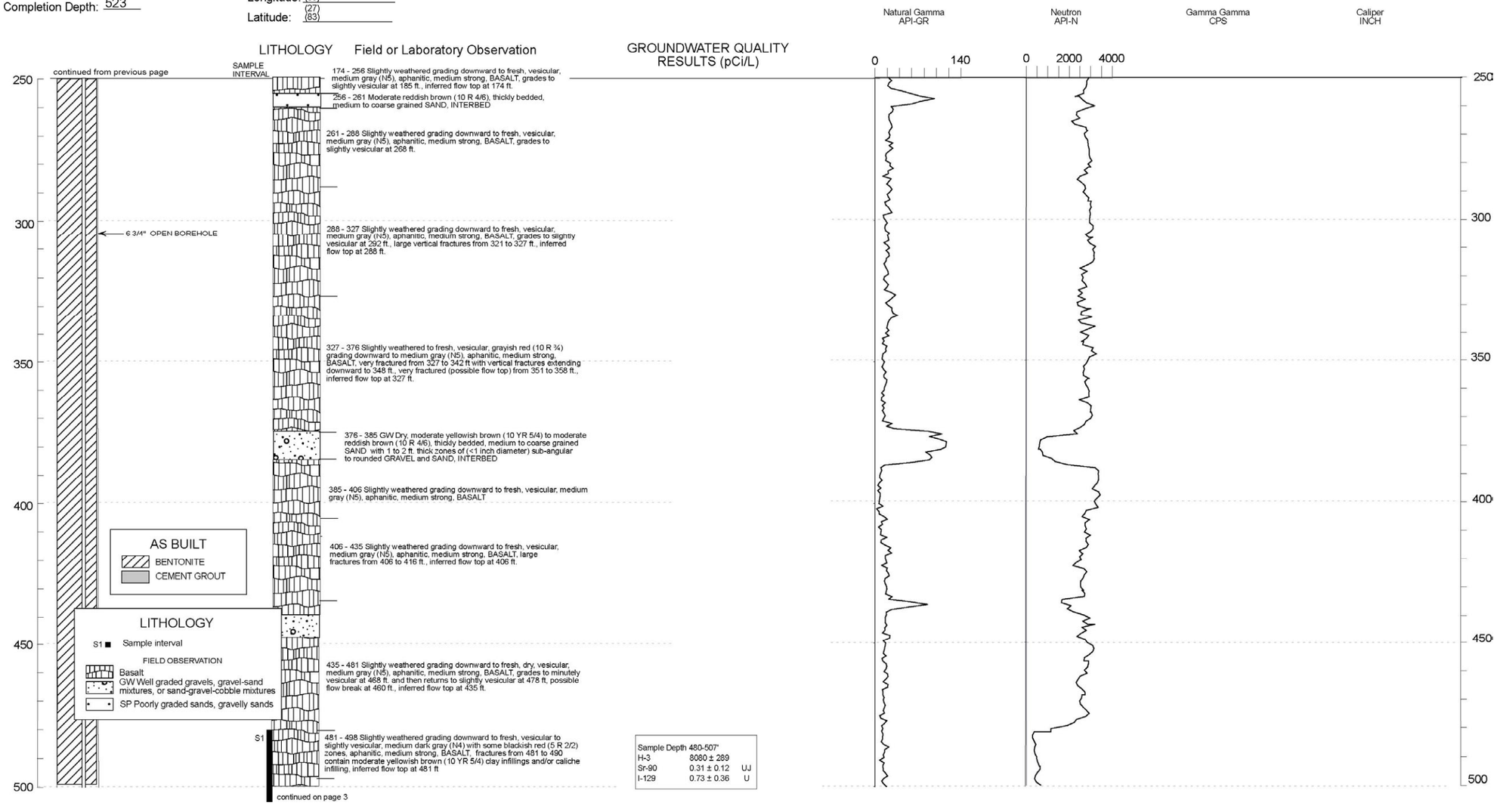
WELL NAME: **ICPP-1798 pg 2**
Facility: INTEC (USGS)
Well Type: Peizometer
Well Status: Active
Year Drilled: 2002
Total Depth: 723.6'
Start Date: 8/1/02
End Date: 9/03
Completion Depth: 523

Brass Cap
Easting: (27) (83)
Northing: (27) (83)
Longitude: (27) (83)
Latitude: (27) (83)

Measuring Point
Easting: (27) (83)
Northing: (27) (83)
Longitude: (27) (83)
Latitude: (27) (83)

Driller: Dynatec
Geologist: A. Bailey, S. Smith (MSE)
Drill Method: Air rotary, Wireline Core
Drill Fluid: Air/water
Land Surface: (29)BC (88)BC (29)MP (88)MP

Todays Date: 1/30/03
Water Level:
Water Level Date:
Water Level Access:



Sample Depth 480-507'		
H-3	8080 ± 289	
Sr-90	0.31 ± 0.12	UJ
I-129	0.73 ± 0.36	U

WELL NAME: **ICPP-1798 pg 3**
Facility: INTEC (USGS)
Well Type: Peizometer
Well Status Active
Year Drilled: 2002
Total Depth 723.6'
Start Date 8/1/02
End Date 9/2003
Completion Depth: 523'

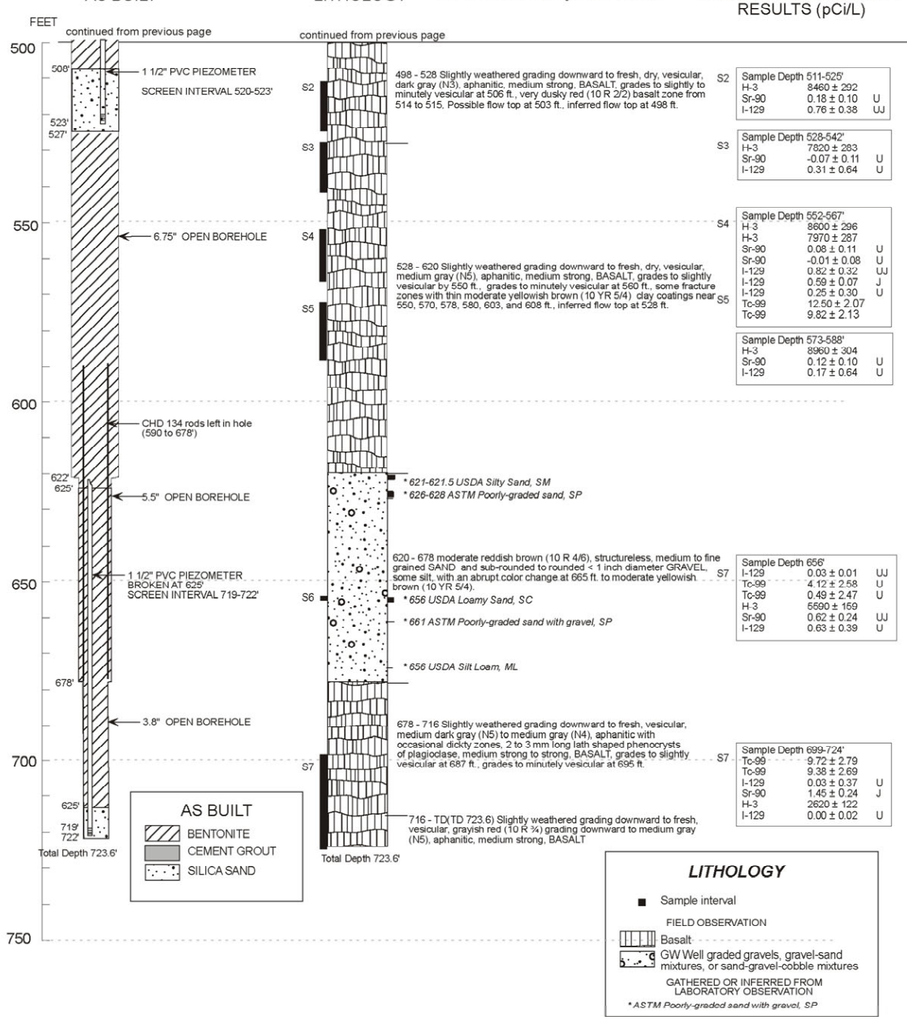
Brass Cap
Easting: (27) (83)
Northing: (27) (83)
Longitude: (27) (83)
Latitude: (27) (83)

Measuring Point
Easting: (27) (83)
Northing: (27) (83)
Longitude: (27) (83)
Latitude: (27) (83)

Driller: Dynatec
Geologist: A. Bailey, S. Smith (MSE)
Drill Method: Air rotary, Wireline Core
Drill Fluid: Air/water
Land Surface: (29)BC (88)BC (29)MP (88)MP

Todays Date: 1/30/03
Water Level:
Water Level Date:
Water Level Access:

AS BUILT | LITHOLOGY | Field or Laboratory Observation | GROUNDWATER QUALITY RESULTS (pCi/L)



S2 Sample Depth 511-525'

H-3	8460 ± 292	
Sr-90	0.18 ± 0.10	U
I-129	0.76 ± 0.38	UJ

S3 Sample Depth 528-542'

H-3	7820 ± 283	
Sr-90	-0.07 ± 0.11	U
I-129	0.31 ± 0.64	U

S4 Sample Depth 552-567'

H-3	8600 ± 296	
H-3	7970 ± 287	
Sr-90	0.08 ± 0.11	U
Sr-90	-0.01 ± 0.08	U
I-129	0.82 ± 0.32	UJ
I-129	0.59 ± 0.07	J
I-129	0.25 ± 0.30	U
Tc-99	12.50 ± 2.07	
Tc-99	9.82 ± 2.13	

S5 Sample Depth 573-588'

H-3	8960 ± 304	
Sr-90	0.12 ± 0.10	U
I-129	0.17 ± 0.64	U

S7 Sample Depth 656'

I-129	0.03 ± 0.01	UJ
Tc-99	4.12 ± 2.58	U
Tc-99	0.49 ± 2.47	U
H-3	5590 ± 159	
Sr-90	0.62 ± 0.24	UJ
I-129	0.63 ± 0.39	U

S7 Sample Depth 699-724'

Tc-99	9.72 ± 2.79	
Tc-99	9.38 ± 2.69	
I-129	0.03 ± 0.37	U
Sr-90	1.45 ± 0.24	J
H-3	2620 ± 122	
I-129	0.00 ± 0.02	U